Training methods for keyboard operators

Lillian G. Malt

On the whole, people find it easy to accept that some school teachers are better teachers than others or that pupils will do consistently better with one teacher than with another. It is readily conceded that the personality of the teacher plays some part in this, and it may even be conceded that teachers use different methods and that some methods are easier to follow, and produce better results, than others. It is quite generally accepted that some schools are better than others. 'Better' may be defined in various ways. If we accept in this context a definition in terms of the number of pupils who obtain university places, then schools may be ranked in success order. If we were asked why Manchester Grammar School, or Academy X in France, are accepted as being the best of their kind, we would probably say something about the quality of the students they turn out, and relate this quality to the principal and his organisation of the school, the personality of the teachers, and their methods of teaching. It should not be too difficult then to agree that methods of training will have some effect on the standards finally attained.

In the industrial world formal training, ie the organisation of training in a formal manner, away from the production floor, is relatively new. Craft training with the apprentice learning 'at the feet' of the master has been the pattern for apprenticeship schemes. Training periods were measured in years, and most apprenticeships were for three to five years. Standards of attainment varied enormously. Even today many apprenticeship schemes require only that a period of time in a working environment should elapse for qualification. There is often no final examination, nor is there any check to ensure that all aspects of the skill requirements are covered. Much of apprenticeship training today is still of the 'Sit-by-Jack' type. As an example, take keyboard training of all kinds in the printing industry. It would not be overstating the case to say that approximately 80 per cent of keyboard operators, hot metal and others, have 'picked up' whatever keyboard skills they have attained.

Hardly a scientific way of learning! It cannot be, because the learners are not trained to analyse requirements and develop suitable methods. They do the best they can, and in terms of printing keyboard operating this is a pretty poor best with a generally accepted standard for 'passing out' of 6,000 keystrokes per hour and a high degree of fatigue.

The development of more scientific methods of training began during the second world war when there was an urgent need to transfer women workers from peace-time industries to jobs in the engineering and allied industries vacated by men called up for the armed services. It was found practicable to re-design some assembly-line work and to train women to carry out the resultant simplified operations. In this situation it was obviously important that the training period should be as short as possible. A 50 per cent reduction in the normal training period might mean that twice as many women could be transferred to war work in a given period of time. British consultants and psychologists, and in particular A. H. Seymour, 'set about designing training schemes which were revolutionary in their approach to the task of learning industrial operations, and in fact often reduced the learning period to even less than half the normal time.' Seymour was notably followed by his brother, W. D. Seymour, and by J. D. Ladhams and S. D. M. King, who have made significant contributions to the development of training industrial skills in this country, in America, where Ladhams now lives, and in Norway where David King worked for some years.

The importance of using good methods of basic training lies in the effects which may be observed in increased production through speed of operation, increased accuracy, in shorter learning time, and as a by-product, reduced labour turnover. People who learn easily to perform well are more likely to remain in jobs than if they are frustrated by slow and difficult learning procedures. Charts 1, 2 and 3 show the effects of using the analytical or skills analysis method of training on these factors.

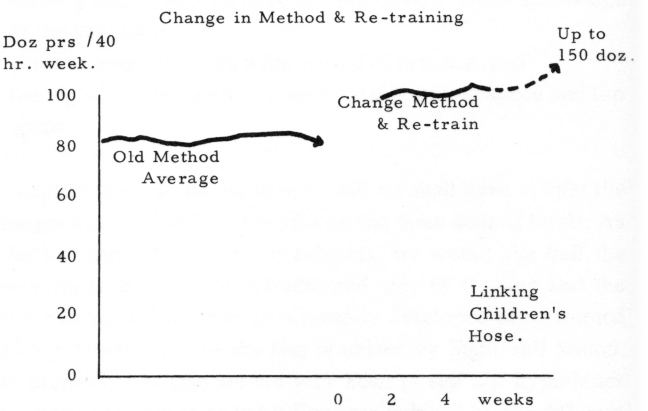

Chart 1

Chart 1 shows the increase in production which resulted from retraining experienced operators who had previously only been able to maintain an average output of just over 80 dozen pairs of children's hose in a 40-hour week. After undergoing retraining for two weeks, output is up to nearly 100 dozen per week and nine weeks after returning to production the average output is up to 150 dozen per week, or nearly double.

In Chart 2 we have two different factories. Both were set up in

country districts where a new labour force had to be trained. Both used the same type of machinery. Factory B was started before factory A, and in factory B the traditional method of putting operators to work, by showing and telling them what they had to do, was followed. Two and a half years after commencement, workers in factory B were turning out 130 dozen hose per week. Factory A was started with analytical training methods. Four months after starting they were producing at 130 dozen per week and two and a half years after commencement the weekly average was 210 dozen. The reduction in learning time, as well as the increase in production, is highly significant.

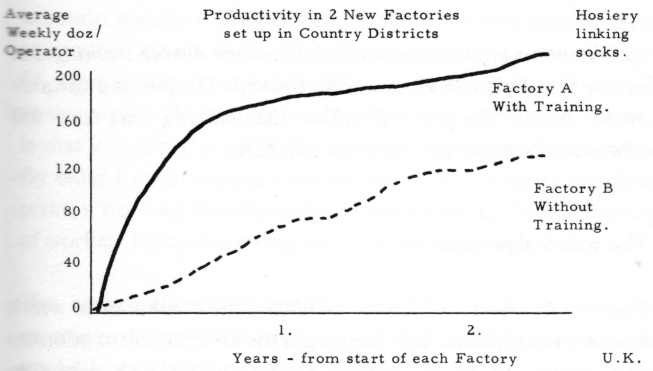

Chart 2

Both these charts tend to explode the theory that, once a skill has been mastered, it only requires practice to increase speed. It seems fairly obvious that the methods originally used in training workers had, in factory B, some inhibiting effect on attaining speed. Even after two and a half years of practice, operators were not able to match the speeds which those operators who had been trained correctly were able to surpass after four months. Chart 1 shows how the same workers, operating the same machines, producing the same finished output, and having the same incentives were not able to produce more until they were retrained.

It is generally conceded that high labour turnover in the first year of employment, and especially in the first three months, is mainly due to inability of the worker to adjust to the job and to the firm. Reducing labour turnover amongst new employees is economic good sense for employers. It is also social good sense for any nation. W. D. Seymour put this very clearly. 'Improvements in industrial skills and in their acquisition are thus important to the individual and to society for more than economic reasons. To enable people—and especially young people—to become competent and confident workers in industry gives them social standing, and facilitates their integration into the social working group. To show them that they can acquire new skills to tackle a new job gives them a feeling of security in a rapidly changing industrial world. . . .'

Chart 3 shows the effect of good training methods on labour turnover.

The significant factor here is that in the first factory the leavers represented 50 per cent of the labour force. In the second factory they represented only 20 per cent. The leaving rate is much more even and is more likely to be in accord with 'natural' reasons for leaving.

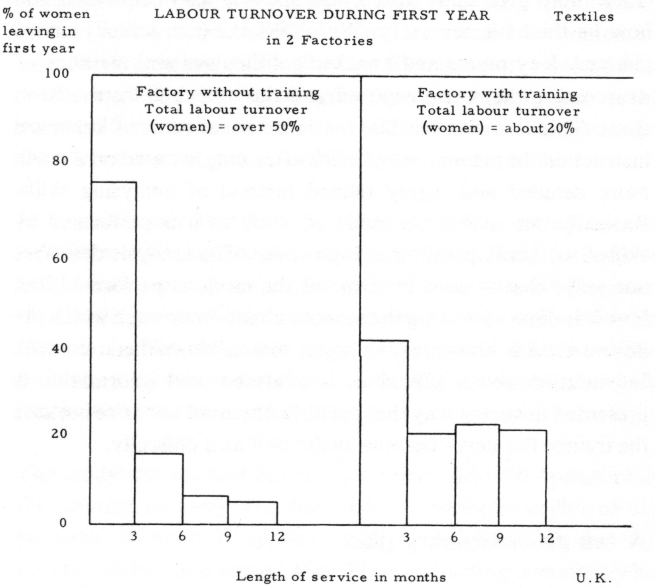

Chart 3

Chart 4 shows the results of training three groups of workers to perform the same task, using three different methods of training. The first group followed the traditional 'Sit-by-Jack' method. With the experimental group a form of the analytical method of training was used, and the Ministry of Labour—Training Within Industry (TWI)—method was used with the third group. The results shown were attained after 12 weeks of training with each of the groups, and are given in terms of time and accuracy. All the workers using the analytical method attained a good standard. With the TWI method, four attained a good standard and the others ranged from average to very poor. With 'Sit-by-Jack' only one worker attained a good standard. One fell by the wayside completely and the others ranged from standard to poor. In addition, all the workers in the experimental group where the analytical method had been used were able to go on and tackle more difficult tasks. They had 'overcome the difficulty of training for adaptability to new and more difficult work'.

Diagram showing comparative performance of the trainees in the twelfth week test

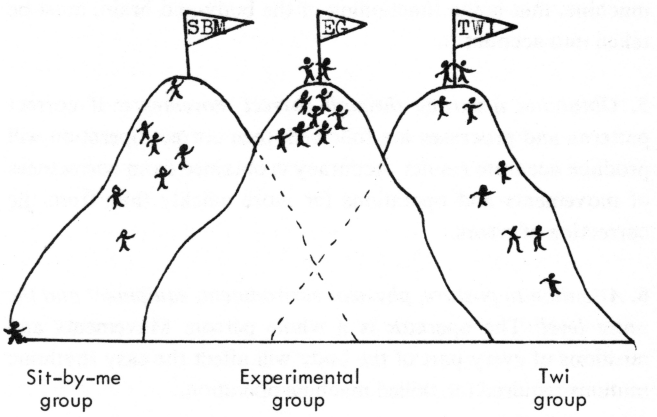

Chart 4

In the traditional 'Sit-by-Jack' method, a trainee works alongside a skilled worker who demonstrates how he or she does the job. 'Jack' may give some instruction and will also help when and how he thinks it necessary. With TWI the instruction is more planned. Key points and knacks, ie difficulties and methods of overcoming them, are exposed and the trainee is instructed in them. This is somewhat like the more usual form of keyboard instruction. In the *analytical method* training is based on a much more detailed and highly refined method of analysing skills. Basically, an analysis is made of a job as it is performed by skilled workers operating at high speed. The analysis describes not only what is done in terms of the motions performed, but how it is done by stating the sensory channels through which the information is conveyed, eg sight, touch, kinaesthetic control. Information about difficulties is analysed, and information is presented in such a way that the difficulty need not arise because the trainee has never become aware of it as a difficulty.

A ten-point training plan

Basic steps in the development of an analytical method training plan.

1. *The requirements of the job at speed:* Every aspect for the performance of the task at speed is analysed. Operating at speed requires different motions and often new skills are called for. Thus, in keyboarding, high speeds require a reading skill which is very different from reading for slow operation.

2. *The requirements for performance of the job in sensory terms:* The analysis describes not only what is done in terms of motions performed, but how it is done by stating the sensory channels through which the input of information is translated into output, eg sight, hearing, touch, kinaesthetic control.

3. *Creating motion patterns related to sensory requirements:* Smooth motion patterns related to sensory requirements for performing the job at speed are designed together with related and meaningful exercises which will build up and develop the motor-sensory response system.

4. *A breakdown of the learning process into meaningful assimilable wholes:* When doing this the mechanics of the human machine, that is the functioning of the body and brain, must be taken into account.

5. *Obtaining accuracy through correct movements:* If correct patterns and processes are followed, then correct operation will produce accurate results. Accuracy is obtained from correctness of movements and operations far more quickly than from the correction of errors.

6. *Attention to posture, physical environment, equipment and the noise level:* The operator is a whole person. Movements and positions of every part of the body will affect the easy rhythmic motions required for skilled machine operation.

7. *Phasing standards of attainment:* Better results are obtained when trainees know how they are progressing and how their rate of progress compares with standard phased progression rates.

8. *Adaptation to individual differences:* All training methods must be flexibly attuned to the individual needs of each operator.

9. *Freeing the conscious mind:* All operations which are to be performed at speed, with accuracy repetitively over long periods must—to some extent—be performed subconsciously. Rhythmic motion patterns assist in this. For operators who will use computer keyboards, this is an essential prerequisite for skilled performance.

10. *Attention to interpersonal relationships during training and on the job:* Feelings of operators towards the job and towards people within the job will affect the learning rate and will subsequently affect performance standards.

The training process

Training has been defined as 'providing the conditions in which learning takes place'. Skill learning is the assimilation of information which can be reproduced to a standard with minimum fatigue. Training for a skill presupposes that learning, to produce to an approved standard—both quantitatively and qualitatively—can take place. This is very different from training to use a machine or training to produce.

In typesetting terms, almost anyone using any method can learn to operate a keyboard at 6,000 keystrokes per hour. In typist terms this is at 20 wpm and in printing terms 17 wpm. Most people can learn to operate at 12,000 keystrokes per hour, given enough time. But systematic and careful training is required to learn to operate at any speed significantly over 18,000 keystrokes per hour, accurately and without fatigue. Only if a well-designed training programme is followed will operators be able to attain and maintain speeds of 24,000 to 30,000 keystrokes per hour without fatigue.

We might define the requirements for keyboarding at high speed as—reading simultaneously with keying, and operating controls as required. Keyboarding slowly will admit of reading, then keying. If beginners are permitted to develop the habit of reading, followed by keying, it will not be possible to attain high speeds until this habit has been eliminated and keying continues without a break and without the eyes being required to break off from reading in order to guide fingers to the keys.

For operators who will use computer keyboards, it is essential that reading and keying be done subconsciously to allow for conscious attention to be given to operating the machine; instructing the computer. The strain upon the human machine is too great if reading, keying and machine operations all require almost simultaneous conscious attention. Even in hot metal workshops where the 'expertise' of two-fingered operators is jealously protected, it is conceded that, although the two-fingered operators may be able to operate as accurately and as fast as the men who use correct fingering, they cannot maintain

the rate for as long, and they cannot do it as easily. One of the main reasons why hot metal operators will consider retraining is 'so that I will not be so terribly tired after a day's work'. The effort required to perform all these operations consciously is prodigious. It is probable that the high accuracy of high-speed operators is due to the ability to use the conscious mind for non-repetitive tasks and to be highly alert to and aware of these, while remaining untired, through using the subconscious mind for repetitive tasks.

Results of the analytical method

In the training of typists, the analytical method has produced accurate speeds of from 70–105 wpm in the time usually taken to produce speeds of 45–50 wpm. Mature women, usually over 35 years of age, have been able to learn to type at 40 wpm in twelve weeks. A very great advantage of the analytical method is that it makes it possible for older workers to learn new tasks. By older I mean anyone over the age of 35. In many industrial tasks, it has been found possible to extend the age for recruitment of workers because learning has been made possible.

The analytical method has been applied to the retraining of experienced keyboard operators in the printing industry. In works A, operators on Lumitype machines had had conventional typewriting training before transferring to the typewriter-style keyboards. Some of these operators had previously operated Linotypes and some had used TTS machines of various kinds.

The average operating output of the group was 6,600 keystrokes per hour fifteen months after training and transferring to the new machines. After periods of retraining of from two to four weeks, the average output was assessed at 12,600 keystrokes per hour. Literal errors had been reduced from 4.8 per 100 words set to 1.9 per 100 words set. Thirteen of the twenty-four men were able to operate at speeds of 18,900 keystrokes per hour. Previously only two men were able to do this. The top speed attained, averaged over three tests, was 24,480 keystrokes per hour. Repeated comments were made by the men regarding the ease with which they were operating and that they were far less fatigued after a day's work than before they were retrained. In works B, Linotype operators were transferred to computer-operated typewriter-style keyboards. The operators received four weeks' keyboard training on typewriters, followed by four weeks practice learning to operate the machines. Two months later, the average output was at 14,000 keystrokes per hour.

It is quite clear that Linotype operators who retrain to use typewriter-style keyboards are faced with a fairly formidable task. Motor sensory nerves, which have been trained to respond to stimuli, are now required to respond to the same stimulus through a different sensory nerve path. Careful planning of the training programme for these operators can make this task much quicker and easier for them.

The analytical method has not yet been used with operators in the printing industry who have had no previous keyboard experience. When it is applied to beginners, I believe that the results will be quite remarkable. When retraining operators who have had experience, much time and effort has to be given both by the tutor and the operator to the elimination of old habits. When correct habits are inculcated from the beginning, we may look forward to operators who will effortlessly produce at from 30,000–36,000 keystrokes per hour.

Literature

Belbin, Dr E. Can training for skilled crafts be shortened? *New Scientist* 19 December 1957.

King, D. *Training within the organization.* Tavistock Publications London 1964.

Seymour, W. D. *Industrial skills.* Pitman London 1966.